LETTER OF NOTIFICATION

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March 30, 1999.

Ms. Lydia Beiswanger, Chief Deputy
Merced County Board of Supervisors
2222 M Street
Merced, CA 95340.

Dear Ms. Beiswanger:

This letter is to inform you of our intent to submit a proposal to the CALFED Bay-Delta Program entitled Microbial sensors for selenium hazard assessment and development of site-specific selenium objectives". It has been recognized by scientists involved in selenium research that the 5 ppb concentration objective is insensitive to the spatial and temporal dynamics of the ecosystem - hence the objective may over-restrictive in some locations at certain times and not restrictive enough at other times and a other locations. The objective of this project is to derive more sensitive and accurate biosensors for selenium hazard assessment.

The long term goal of agricultural water districts involved in the Grassland Bypass Project is to develop a real-time forecasting system for selenium loading to the San Joaquin River. As the District progresses in its ability to manage selenium drainage this goal becomes more achievable. The development of seasonal, site-specific standards for selenium in the San Joaquin River will benefit the Grassland Area farmers, providing greater flexibility of operation and at the same time be protective of the ecosystem.

We believe that successful completion of this study will be of great benefit to landowners and water district personnel in the Grassland watershed of Merced County.

Sincerely,

Nigel W.T. Quinn

Geological Scientist

IX. COSTS AND SCHEDULE TO IMPLEMENT PROPOSED PROJECT

The proposed project will have a two year duration with the initiation of microbiota monitoring and pure compound foodchain studies occurring during year 1, the continuation of microbial monitoring and biomass foodchain studies during year 2, and the field coordination with the SJRMP Water Quality subcommittee in both years 1 and 2. Procedures for the isolation, characterization and classification of microbiota, procedures for obtaining microbiota CLPP, and advanced environmental measurement methods for the speciation of Se in biomass, will be established and validated during the first 6 months of the project and will be implemented during the project's two year term.

The work schedule is shown in the table below. Two progress reports and one final project report will be prepared summarizing the objectives accomplished during the year and results from activities in the SJDS. Demonstrations and workshops will be conducted to disseminate results form the project and to introduce potential users to the Biolog CLPP microbiota monitoring technology.

PROJECT MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
REPORTS											X	X											X	X
TASK 1.1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
TASK 1.2										X	X	X	X	X	X	X	X	X	X	X	X	X		
TASK 1.3						X	X	X	X	X	X	X	X	X	X	X	X	X	X					
TASK 1.4												X	X	X	X	X	X	X	X	X	X	X		
TASK 1.5						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
TASK 2.1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
TASK 2.2										X	X	X	X	X	X	X	X	X	X	X	X	X		
TASK 2.3						X	X	X	X	X	X	X	X	X	X	X	X	X						
TASK 2.4												X	X	X	X	X	X	X	X	X	X	X		
TASK 2.5						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
TASK 2.6			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			

The following pages contain summary budgets and individual institutional budgets for the two year project period. Two budget formats are included: one assuming that the State of California 10% overhead rate applies to the project and another assuming that the Federal 50.1% overhead rate applies to the project. A separate budget is also included for Tasks 1 and 2.

OMB Approval No. 0348-0044

BUDGET INFORMATION -- Non-Construction Programs

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Task 1		$	$	$ 289,905	$	$
2. Task 2				356,740		
3.						
4.						
5. TOTALS		$	$	$ 646,645	$	$

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1)	(2)	(3)	(4)	TOTAL (5)
a. Personnel	$	$	$ 288,946	$	$
b. Fringe Benefits			62,806		
c. Travel			20,000		
d. Equipment			15,000		
e. Supplies			52,000		
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges (Sum of 6a - 6h)			438,752		
j. Indirect Charges			207,893		
k. TOTALS (Sum of 6i and 6j)	$	$	$ 646,645	$	$
7. Program Income	$	$	$	$	$

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Standard Form 424A (4-88)
Prescribed by OMB Circular A-102

ITEMIZED BUDGET - UCB

Categories	Year One	Year Two	Total Project
a. Personnel			
PI, T. Leighton	0	0	0
Staff Research Associate	30,200	31,725	61,925
Graduate Student	17,850	18,206	36,056
Lab Assistant	12,120	12,600	24,720
TOTAL PERSONNEL	60,170	62,531	122,701
b. Fringe Benefits			
Normal	15,400	16,415	31,815
TOTAL FRINGE BENEFITS	15,400	16,415	31,815
c. Travel			
Scientific Presentation & Field	5,000	6,000	11,000
TOTAL TRAVEL	5,000	6,000	11,000
d. Equipment			
Equipment	0	0	0
TOTAL EQUIPMENT	0	0	0
e. Supplies and Recharges			
Supplies	14,000	16,000	30,000
Recharges	0	0	0
TOTAL SUPPLIES	14,000	16,000	30,000
f. Contracts	0	0	0
g. Construction	0	0	0
h. Other	0	0	0
i. TOTAL DIRECT COSTS	94,570	100,946	195,516
j. INDIRECT COSTS (less fees)	8,920	9,505	18,425
TOTAL INDIRECT COSTS (10%)	8,920	9,505	18,425
k. TOTAL PROJECT COSTS	103,490	110,451	213,941
l. TOTAL REQUESTED	103,490	110,451	213,941
* Graduate student fees (included w/ benefits)	5,370	5,895	11,265

ITEMIZED BUDGET - UCD

Categories	Year One	Year Two	Total Project
a. Personnel			
PI, R.M. Higashi	5,446	5,718	11,164
PI, T. W-M. Fan	5,732	6,018	11,750
Postdoctoral Scientist	30,380	34,178	64,558
Other	0	0	0
TOTAL PERSONNEL	41,558	45,914	87,472
b. Fringe Benefits			
Normal	9,973	11,018	20,991
TOTAL FRINGE BENEFITS	9,973	11,018	20,991
c. Travel			
Scientific Presentation & Field	1,500	2,000	3,500
TOTAL TRAVEL	1,500	2,000	3,500
d. Equipment			
(see details)	12,000	0	12,000
TOTAL EQUIPMENT	12,000	0	12,000
e. Supplies and Recharges			
Supplies	10,000	12,000	22,000
Instrument Recharges	0	0	0
TOTAL SUPPLIES	10,000	12,000	22,000
f. Contracts	0	0	0
g. Construction	0	0	0
h. Other	0	0	0
i. TOTAL DIRECT COSTS	75,031	70,932	145,963
j. INDIRECT COSTS (less equipment)	6,303	7,093	13,396
TOTAL INDIRECT COSTS (10%)	6,303	7,093	13,396
k. TOTAL PROJECT COSTS	81,334	78,025	159,359
l. TOTAL REQUESTED	81,334	78,025	159,359

ITEMIZED BUDGET - LBNL

Categories	Year One	Year Two	Total Project
a. Personnel			
PI, Nigel Quinn	38,773	40,000	78,773
Other	0	0	0
TOTAL PERSONNEL	38,773	40,000	78,773
b. Fringe Benefits			
Normal	5,000	5,000	10,000
TOTAL FRINGE BENEFITS	5,000	5,000	10,000
c. Travel			
Scientific Presentation & Field	2,500	3,000	5,500
TOTAL TRAVEL	2,500	3,000	5,500
d. Equipment			
Computer & Computer Supplies	1,500	1,500	3,000
TOTAL EQUIPMENT	1,500	1,500	3,000
e. Supplies and Recharges			
Supplies	0	0	0
Recharges	0	0	0
TOTAL SUPPLIES	0	0	0
f. Contracts	0	0	0
g. Construction	0	0	0
h. Other	0	0	0
i. TOTAL DIRECT COSTS	47,773	49,500	97,273
j. INDIRECT COSTS (less equipment)	4,627	4,800	9,427
TOTAL INDIRECT COSTS (10%)	4,627	4,800	9,427
k. TOTAL PROJECT COSTS	52,400	54,300	106,700
l. TOTAL REQUESTED	52,400	54,300	106,700

TOTAL BUDGET

Categories	Year One	Year Two	Total Project
a. Personnel TOTAL PERSONNEL	$140,501	$148,445	$288,946
b. Fringe Benefits TOTAL FRINGE BENEFITS	$30,373	$32,433	$62,806
c. Travel TOTAL TRAVEL	$9,000	$11,000	$20,000
d. Equipment TOTAL EQUIPMENT	$13,500	$1,500	$15,000
e. Supplies and Recharges TOTAL SUPPLIES	$24,000	$28,000	$52,000
f. Contracts	$0	$0	$0
g. Construction	$0	$0	$0
h. Other	$0	$0	$0
i. TOTAL DIRECT COSTS	$217,374	$221,378	$438,752
j. INDIRECT COSTS (less equipment/fees) TOTAL INDIRECT COSTS (10%)	$19,850	$21,398	$41,248
k. TOTAL PROJECT COSTS	$237,224	$242,776	$480,000
l. TOTAL REQUESTED	$237,224	$242,776	$480,000

ITEMIZED BUDGET - UCB

Categories	Year One	Year Two	Total Project
a. Personnel			
PI, T. Leighton	0	0	0
Staff Research Associate	30,200	31,725	61,925
Graduate Student	17,850	18,206	36,056
Lab Assistant	12,120	12,600	24,720
TOTAL PERSONNEL	60,170	62,531	122,701
b. Fringe Benefits			
Normal	15,400	16,415	31,815
TOTAL FRINGE BENEFITS	15,400	16,415	31,815
c. Travel			
Scientific Presentation & Field	5,000	6,000	11,000
TOTAL TRAVEL	5,000	6,000	11,000
d. Equipment			
Equipment	0	0	0
TOTAL EQUIPMENT	0	0	0
e. Supplies and Recharges			
Supplies	14,000	16,000	30,000
Recharges	0	0	0
TOTAL SUPPLIES	14,000	16,000	30,000
f. Contracts	0	0	0
g. Construction	0	0	0
h. Other	0	0	0
i. TOTAL DIRECT COSTS	94,570	100,946	195,516
j. INDIRECT COSTS (less fees)	44,957	47,906	92,863
TOTAL INDIRECT COSTS (50.4%)	44,957	47,906	92,863
k. TOTAL PROJECT COSTS	139,527	148,852	288,379
l. TOTAL REQUESTED	139,527	148,852	288,379
* Graduate student fees (Benefits)	5,370	5,895	11,265

ITEMIZED BUDGET - UCD

Categories	Year One	Year Two	Total Project
a. Personnel			
PI, R.M. Higashi	5,446	5,718	11,164
PI, T. W-M. Fan	5,732	6,018	11,750
Postdoctoral Scientist	30,380	34,178	64,558
Other	0	0	0
TOTAL PERSONNEL	41,558	45,914	87,472
b. Fringe Benefits			
Normal	9,973	11,018	20,991
TOTAL FRINGE BENEFITS	9,973	11,018	20,991
c. Travel			
Scientific Presentation & Field	1,500	2,000	3,500
TOTAL TRAVEL	1,500	2,000	3,500
d. Equipment			
(see details)	12,000	0	12,000
TOTAL EQUIPMENT	12,000	0	12,000
e. Supplies and Recharges			
Supplies	10,000	12,000	22,000
Instrument Recharges	0	0	0
TOTAL SUPPLIES	10,000	12,000	22,000
f. Contracts	0	0	0
g. Construction	0	0	0
h. Other	0	0	0
i. TOTAL DIRECT COSTS	75,031	70,932	145,963
j. INDIRECT COSTS (less equipment)	31,768	35,750	67,517
TOTAL INDIRECT COSTS (50.4%)	31,768	35,750	67,517
k. TOTAL PROJECT COSTS	106,799	106,682	213,480
l. TOTAL REQUESTED	106,799	106,682	213,480

ITEMIZED BUDGET - LBNL

Categories	Year One	Year Two	Total Project
a. Personnel			
PI, Nigel Quinn	38,773	40,000	78,773
Other	0	0	0
TOTAL PERSONNEL	38,773	40,000	78,773
b. Fringe Benefits			
Normal	5,000	5,000	10,000
TOTAL FRINGE BENEFITS	5,000	5,000	10,000
c. Travel			
Scientific Presentation & Field	2,500	3,000	5,500
TOTAL TRAVEL	2,500	3,000	5,500
d. Equipment			
Computer & Computer Supplies	1,500	1,500	3,000
TOTAL EQUIPMENT	1,500	1,500	3,000
e. Supplies and Recharges			
Supplies	0	0	0
Recharges	0	0	0
TOTAL SUPPLIES	0	0	0
f. Contracts	0	0	0
g. Construction	0	0	0
h. Other	0	0	0
i. TOTAL DIRECT COSTS	47,773	49,500	97,273
j. INDIRECT COSTS (less equipment)	23,322	24,192	47,514
TOTAL INDIRECT COSTS (50.4%)	23,322	24,192	47,514
k. TOTAL PROJECT COSTS	71,095	73,692	144,787
l. TOTAL REQUESTED	71,095	73,692	144,787

TOTAL BUDGET

Categories	Year One	Year Two	Total Project
a. Personnel TOTAL PERSONNEL	$140,501	$148,445	$288,946
b. Fringe Benefits TOTAL FRINGE BENEFITS	$30,373	$32,433	$62,806
c. Travel TOTAL TRAVEL	$9,000	$11,000	$20,000
d. Equipment TOTAL EQUIPMENT	$13,500	$1,500	$15,000
e. Supplies and Recharges TOTAL SUPPLIES	$24,000	$28,000	$52,000
f. Contracts	$0	$0	$0
g. Construction	$0	$0	$0
h. Other	$0	$0	$0
i. TOTAL DIRECT COSTS	$217,374	$221,378	$438,752
j. INDIRECT COSTS (less equipment/fees) TOTAL INDIRECT COSTS (50.4%)	$100,046	$107,847	$207,893
k. TOTAL PROJECT COSTS	$317,420	$329,225	$646,645
l. TOTAL REQUESTED	$317,420	$329,225	$646,645

Summary Budget(By Task)

Tasks	Direct Labor Hours	Direct Salary & Benefits	Service Contracts	Material & Acq. Costs	Misc. & Other Direct Costs	Total Direct Costs	Indirect Costs (Fed. Rate @ 50.4% MTDC)	Total Costs (Fed. Rate)	Indirect Costs (State Rate @ 10% MTDC)	Total Costs (State Rate)
Task 1	-	150,604	-	13,350	32,400	196,354	93,552	289,906	18,561	215,999
Task 2	-	201,148	-	1,650	39,600	242,398	114,342	356,740	22,687	264,001
Project Mgt. Task	-	-	-	-	-	-	12,163	-	-	
Grand Totals	-	$ 351,752	$ -	$ 15,000	$ 72,000	$ 438,752	$ 220,057	$ 646,646	$ 41,248	$ 480,000

Task1 Budget

TASK 1	Direct Labor Hours	Direct Salary & Benefits	Service Contracts	Material & Acq. Costs	Misc. & Other Direct Costs	Total Direct Costs	Indirect Costs (Fed. Rate @ 50.4% MTDC)	Total Costs (Fed. Rate)	Indirect Costs (State Rate @ 10% MTDC)	Total Costs (State Rate)
UCB	-	61,805	-	-	18,450	80,255	41,788	122,043	8,291	96,273
UCD	-	48,805	-	12,000	11,475	72,280	30,383	102,663	6,028	71,711
LBNL	-	39,994	-	1,350	2,475	43,819	21,381	65,200	4,242	48,015
Project Mgt. Task	-	-	-	-	-	-	-	-	-	
Grand Totals	-	$ 150,604	$ -	$ 13,350	$ 32,400	$ 196,354	$ 93,552	$ 289,906	$ 18,561	$ 215,999

Task2 Budget

TASK 2	Direct Labor Hours	Direct Salary & Benefits	Service Contracts	Material & Acq. Costs	Misc. & Other Direct Costs	Total Direct Costs	Indirect Costs (Fed. Rate @ 50.4% MTDC)	Total Costs (Fed. Rate)	Indirect Costs (State Rate @ 10% MTDC)	Total Costs (State Rate)
UCB	-	92,711	-	-	22,550	115,261	51,075	166,336	10,134	117,668
UCD	-	59,658	-	-	14,025	73,683	37,134	110,817	7,368	87,648
LBNL	-	48,779	-	1,650	3,025	53,454	26,133	79,587	5,185	58,685
Project Mgt. Task	-	-	-	-	-	-	-	-	-	
Grand Totals	-	$ 201,148	$ -	$ 1,650	$ 39,600	$ 242,398	$ 114,342	$ 356,740	$ 22,687	$ 264,001

X. COST SHARING

The Bureau of Reclamation, CalFed (Calfed Project B273), Exxon Corporation, SSRL and the US Army Corps of Engineers have provided previous funding which supported collection of the preliminary data cited in this proposal. A portion of the CalFed and USACE funds will be used for cost sharing during the two year period of the project. The project will have access to Atomic Absorption Spectroscopy and Biolog instrumentation in the UCB BEST facilities. Professor Leighton is the PI of a DOE grant from the SSRL for XAS speciation of selenium in environmental samples by XANES and EXAFS. SLAC beam time will be used for Selenium speciation of CalFed microbiota samples. A portion of Professor Leighton's salary is provided by the University of California.

The Panoche Water District is providing in-kind contributions to the proposed project.

XI. APPLICANT QUALIFICATIONS

The team members include UCB, LBNL, and UCD personnel all of whom have worked in the SJDS for the past five to ten years. The UCB group has specialized in developing tools for the analysis of microbial community structure, function and dynamics in selenium impacted environments. The UCB group has also developed X-ray absorption spectroscopy tools for the *in situ* determination of selenium species and distribution in microbial biomass. The LBNL group has specialized in SJDS selenium fate and transport experiments. LBNL has also developed fate and transport models to support real-time adaptive management of selenium loading. The UCD group has specialized in developing tools for the analysis of algal community structure, function and dynamics in selenium impacted environments. The UCD group has developed GC/MS tools for the determination of selenium species and distribution in algal biomass. The UCD group is recognized for their ability to assess selenium foodchain transfer characteristics and ecotoxic risk.

Professor Terrance Leighton (Microbiology and Biochemistry, UCB)

Profesor Leighton has been a faculty member at UC Berkeley for the past twenty five years. He directs the UCB Bioremediation, Education, Science and Technology Center. Professor Leighton is an expert in microbial biology, microbial ecology, the molecular mechanisms which regulate hazardous metal detoxification and biosorption in bacteria, and the microbial ecophysiology of wastewater treatment systems and damaged environments.

ADMINISTRATIVE POSITIONS:

Director UCB Bioremediation Education Science and Technology Center
Founding Member - European Science Foundation Phytoremediation Scientific Network
UCB Biocomputing Coordinator
CoDirector UCB - CalEPA Bioremediation Validation and Certification Laboratory
Director UCB Advanced Undergraduate Biotechnology Research Program
Founding UCB Member - Science Education Academy of the Bay Area (SEABA)
UC Systemwide Biotechnology and Bioengineering Grant Review Committee

Dr. Nigel Quinn (Geological Scientist, ESD, Lawrence Berkeley National Laboratory)

Nigel Quinn received a BSc (Hons) in irrigation engineering and hydrology from the Cranfield Institute of Technology in England and spent the early part of his career as an irrigation engineer for Tate and Lyle Inc. designing and troubleshooting irrigation systems in England and in Africa. He left England for Iowa in 1978 where he taught agricultural water management, rural water supply engineering and surveying courses for three years, earning an MS in Agricultural and Civil Engineering and conducting research in soil erosion under crop canopy. In 1981 he took a position at Cornell University where he worked on various projects ranging from earthworm vermicomposting, pesticide model development and water supply and sanitation policy in developing countries, co-taught classes in surveying and computer programming and earned a PhD

in civil and environmental engineering in 1987. He then joined the San Joaquin Valley Drainage Program, retaining a faculty affiliation with Cornell, and took responsibility for development of groundwater and drainage models to support the Drainage Program's planning effort. With the sunset of the Drainage Program he has continued his work with the US Bureau of Reclamation dividing his time between monitoring efforts in support of the Grasslands Bypass project, development of real-time forecasting tools for the San Joaquin River and selenium fate and transport research projects. He has been affiliated with Lawrence Berkeley National Laboratory for the past 6 years. Nigel is the author of over 50 publications and reports on various aspects of water resources and drainage engineering.

Dr. Teresa Fan (Associate Research Professor, UCD)

Dr. Teresa W-M. Fan is faculty member in the Department of Land, Air and Water Resources, University of California, Davis. Her research interest has been in the broad area of environmental biochemistry ranging from plant stress biochemistry and Se biogeochemistry in relation to *in situ* bioremediation, to mechanisms of aquatic ecotoxicity of agricultural and industrial discharges. Along CalFed's interest, she has been working on salinity and toxic metals stress on the Asian clam, *Potamocorbula amurensis*, in the Delta/San Pablo Bay, as well as the tradeoffs between algal phytoremediation and ecotoxic risk of selenium in San Joaquin Valley's evaporation ponds. She has served on the 9-member EPA Peer Consultation Workshop on Selenium Aquatic Toxicity and Bioaccumulation (March 1998) which concluded that selenium organic forms and foodchain biochemistry - not total Se - should be the target of ecotoxic investigations and bioremediation goal. Most recently, she was one of the authors of the Central Valley Drainage Implementation Program's comprehensive report on Discharge to the San Joaquin River.

Dr. Richard Higashi (Assistant Research Professor, UCD)

Dr. Richard M. Higashi is a faculty member in the Crocker Nuclear Laboratory, University of California, Davis. He has worked in broad areas of environmental chemistry, ranging from toxicity identification in complex effluents such as pulpmill and oil production discharges, to DOE waste contamination remediation, to agricultural water, soil, and sediment problems of the Central Valley and San Francisco Bay/Delta, as well as air pollution (PM10 and ozone) research in the Central Valley and Sierra Nevada Range. The chemistry of humics and other organic matter plays a central role in all of these research areas, and he is currently engaged in organic matter chemistry investigations in relation to selenium ecotoxic remediation in evaporation ponds of the SJV.

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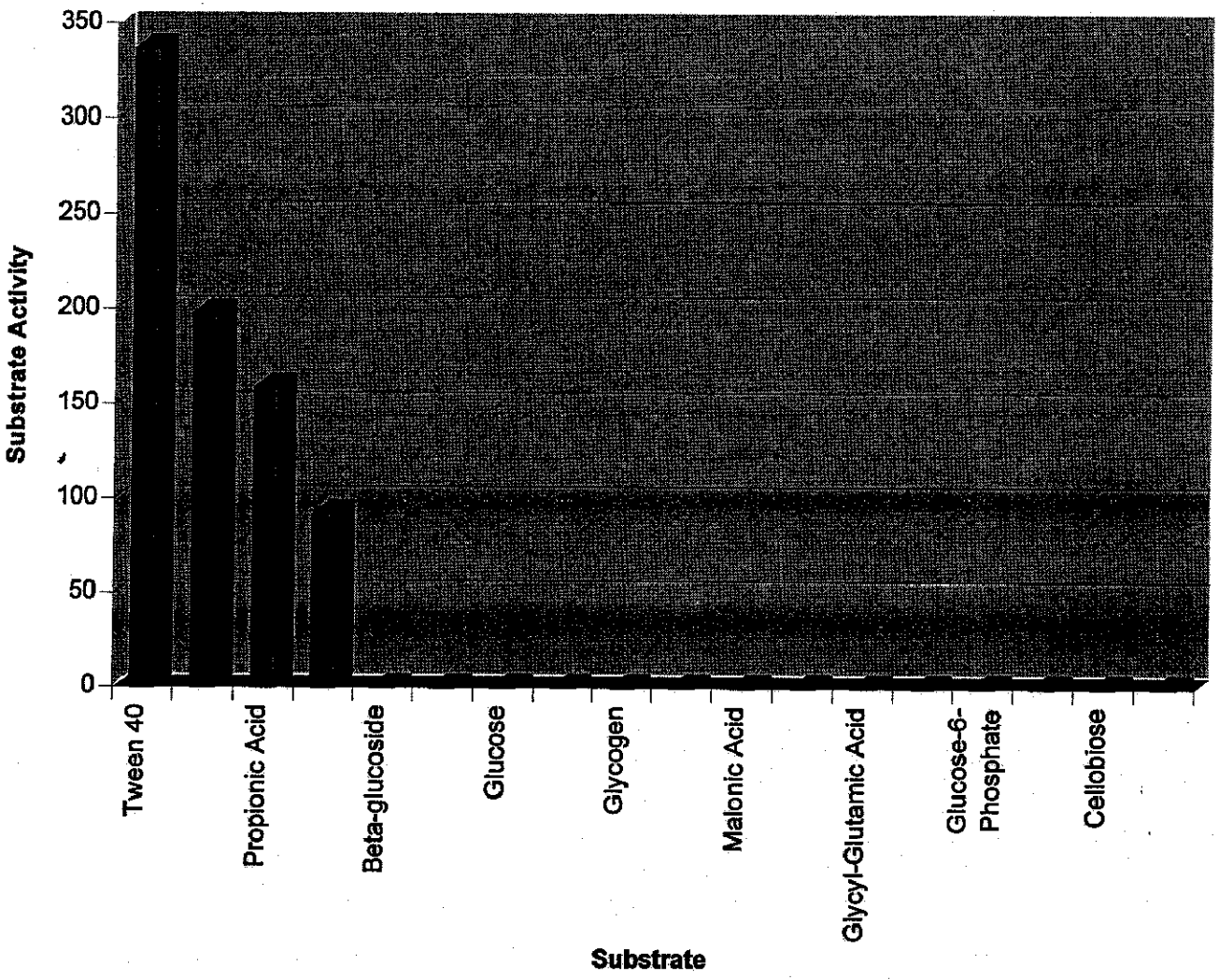
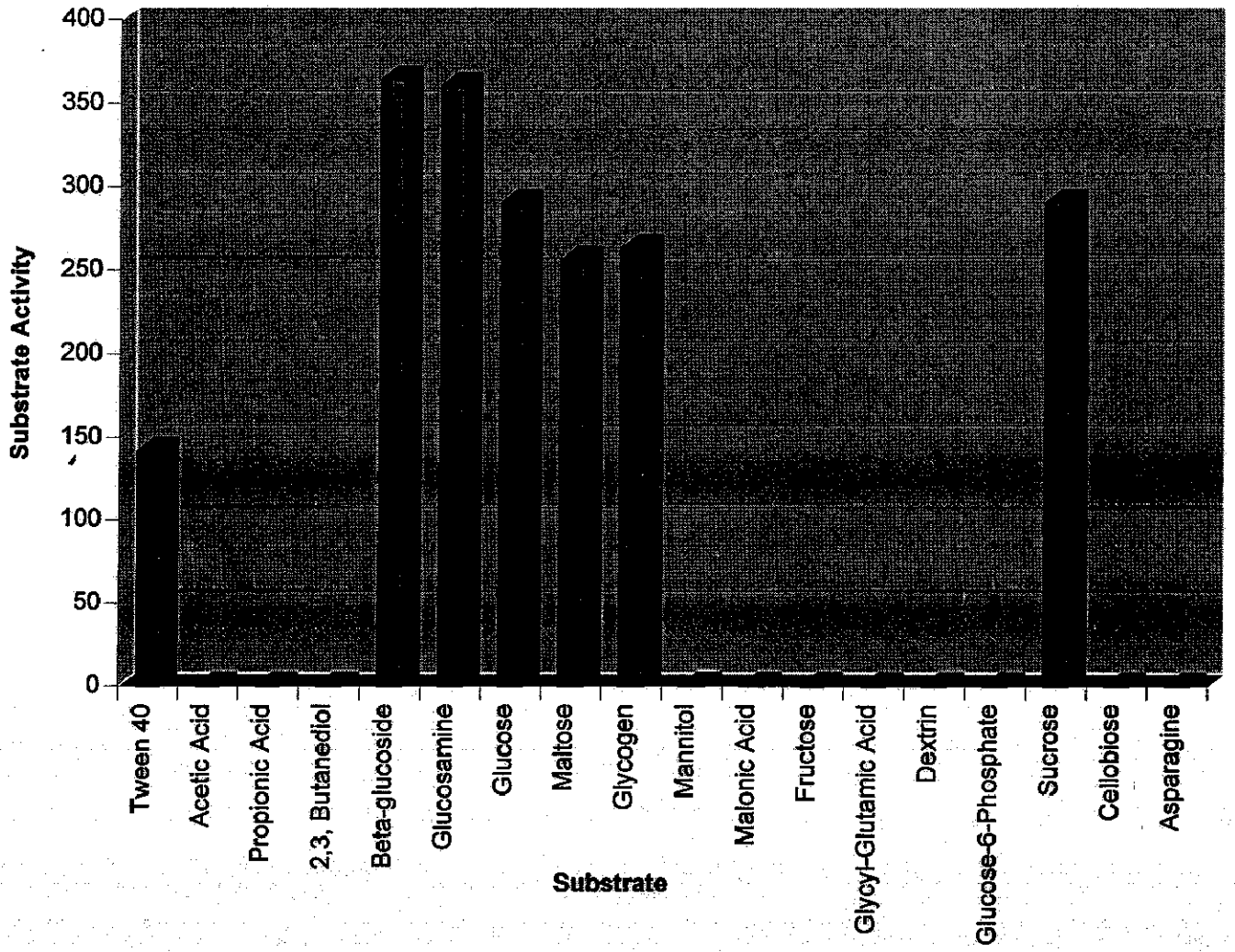
APPENDICES

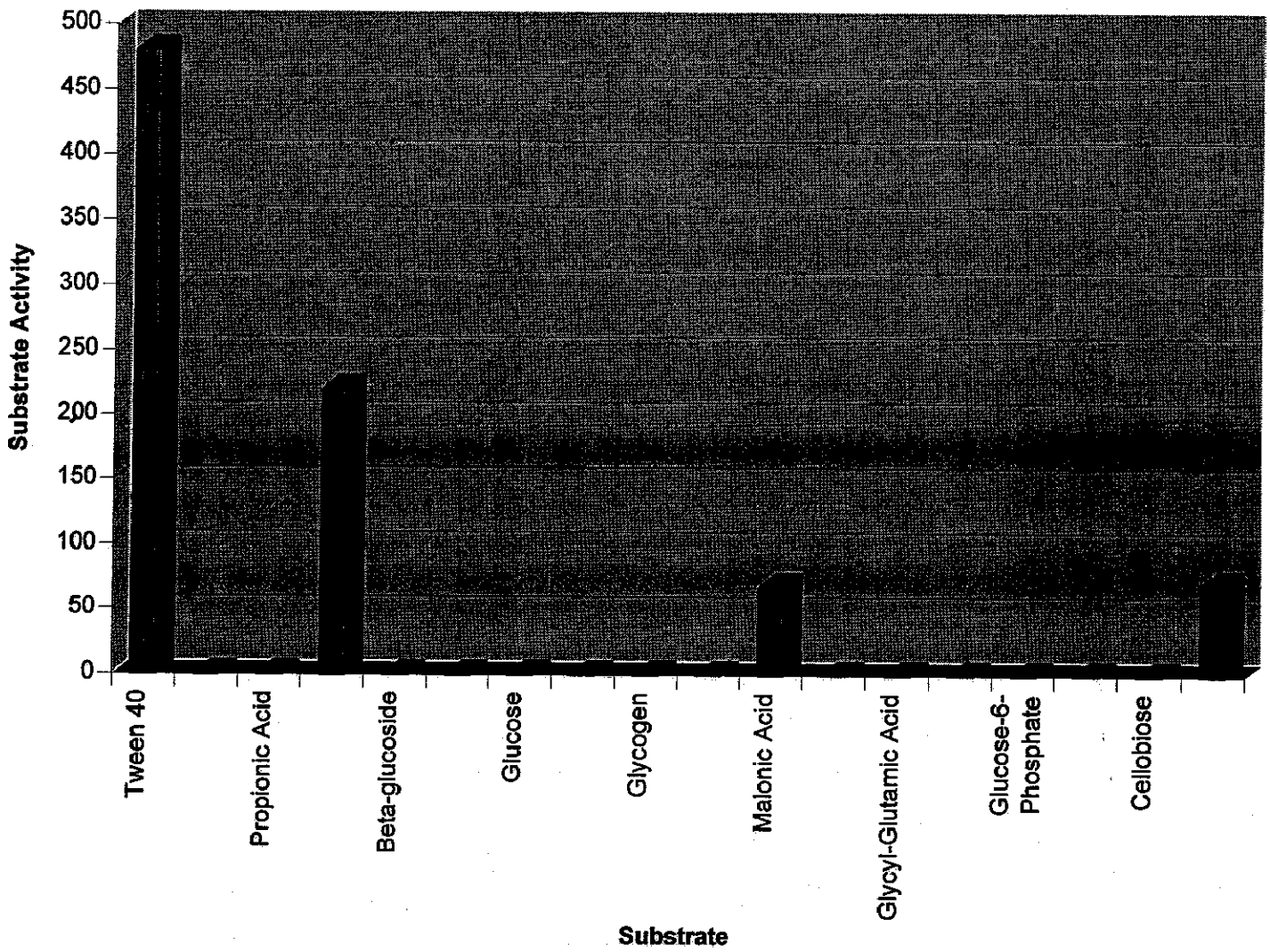
Appendix Figure 7
Normal BIOX Microbial Community Breathprint



Appendix Figure 8
Abnormal BIOX Microbial Community Breathprint 6/28/95



Appendix Figure 9
Recovering BIOX Microbial Community Breathprint 8/18/95



Appendix Table 4: 16S rRNA and Biolog Identification of South Agatha Isolates

Strain	16S ID (primer:926,1492r)	Sim.	16S ID (primer: 27f,519r)	Sim.	Biolog Identification	Sim.
432	*Aeromonas sp2*	0.981	*Aeromonas media*	0.949	*Aeromonas media like DNA group 5A*	0.758
433	*Bacillus licheniformis*	1.00	*Bacillus licheniformis*	1.00	*Bacillus licheniformis*	0.789
434	*Bacillus licheniformis*	0.94	*Bacillus lichniformis*	0.94	*Bacillus licheniformis*	0.897
435	*Bacillus licheniformis*	0.973	*Bacillus licheniformis*	0.973	*Bacillus licheniformis*	0.786
437	*Pseudomonas flavescens str. b62*	0.902			*Pseudomonas viridilivida*	0.655
438a	*Brevibacterium acetylicum*	0.83	*Brevibacterium acetylicum*	0.83	*Lactococcus lactis ss hordniae*	0.787
438b	*Pseudomonas mendocina*	0.836	*Pseudomonas mendocina*	0.946	*Pseudomonas viridilivida*	0.600
439	*Bacillus licheniformis*	1.00	*Bacillus licheniformis*	1.00	*Bacillus licheniformis*	0.936
440	*Bacillus species*	0.78	*Bacillus licheniformis*	0.813	*Bacillus megaterium*	0.530
442	*Pseudomonas flavescens*	0.971	*Pseudomonas mendocino*	0.957	*Pseudomonas viridilivida*	0.819
443	*Pseudomonas flavescens*	0.962	*Pseudomonas mendocino*	0.958	*Pseudomonas viridilivida*	0.849
444	*Aeromonas jandace*	0.902	*Pseudomonas mendocina*	0.958	*Aeromonas media like DNA group 5A*	0.715
445	*Bacillus licheniformis*	0.972	*Bacillus licheniformis*	1.00	*Bacillus licheniformis*	0.92
447a	*Aeromonas salmonicida subsp. achromogenes*	0.900	*Aeromonas media like-DNA group 5a*	0.971	*Aeromonas media like DNA group 5A*	0.829
449	*Pseudomonas stutz14*	0.838			*Pseudomonas viridilivida*	0.782